Montana Department of ENVIRONMENTAL QUALITY

EXAMPLE - 5

HYPOTHETICAL – EXIST ELECTRICAL GENERATING UNIT(EGU)
ASSUME 3 EXISTING GENERATING UNITS
PROPOSED ADDITION OF A 1,675 HP
EMERGENCY GENERATOR (OPERATES 4400 HR/YR)

TOOLS:

Emissions Factors (EF):

Pollutant	(Stationary Gas Turbine) BACT Emissions Limits	Diesel Generators
PM	7.3 lb/hr per unit	0.23 /hp-hr
SO_2	0.83 lb/hr per unit	0.0505 lb/MMBtu
NO_x	11.07 lb/hr per unit	4.82 g/hp-hr
VOC	2.47 lb/hr per unit	0.09 lb/MMBtu
CO	10.78 lb/hr per unit	0.19 g/hp-hr
Emission Factors: Greenhouse Gases from AP-42, Table 3.1-1 (Stationary Gas Turbines)		
CO_2	110 lb/MMBtu*	
CH_4	8.6 E-03 lb/MMBtu*	
N_2O	0.003 lb/MMBtu*	
Emission Factors - Greenhouse Gases from AP-42, Table 3.4-1 (Diesel Generators)		
CO_2	165 lb/MMBtu	
CH_4	0.0081 lb/MMBtu	
N_2O	0 lb/MMBtu	

* 1 MW = 3.41 MMBtu

PROBLEM SOLVING:

Question 1: What would the emissions be for the proposed project?

Example Calculations:
PM_{10} Emissions [tons/yr] =
(3 Units) * (7.30 lb/hr) * (8760 hr/yr)* 1 ton/2000 lb = **95.92 tons/yr**
CH4 Emissions [tons/yr]=
(3 units)*(49.6 MW)*(3.41 MMBtu/MW)*(0.0086 lb/MMBtu)*(8760 hrs/yr)*1 ton/2000lb = **19.11 tons/yr**

Calculations

Calculated Total Emissions (Tons/Year):								
Criteria Pollutants Emissions						GHG Emissions (mass)		
	PM_{10}	SO_2	NO_x	VOC	CO		CO_2	CH_4	N_2O
Existing	95.92	10.91	145.43	32.46	141.65		261,360	19.11	6.67
Proposed									
Total									

Question 2: On a mass basis, what are the total emissions of GHGs?

CO_2+CH_4+N_2O = Total Emissions of GHG's (on a mass basis, tpy)

= _____**TPY (mass)**

Question 3: What are the total emissions of CO_{2e}?

Step 1: Refer to Global Warming Potential (GWP) Table (Title 40, Part 98, Subpart A, Table A-1)
Step 2: Identify pollutants and their respective GWPs.

Pollutant	Global Warming Potential
CO_2	1
CH_4	21
N_2O	310

$$CO_{2e}(tpy) = \sum_i (GWP_i \times MassEmissionRate_i(tpy))$$

CO_{2e}(tpy) Example = (mass CO_2*1) + (mass CH_4 *21) + (mass N_2O *310) =

= _____**TPY CO2e**

Calculations [tons/yr] =
CH4 = 21* 19.26 TPY =
N2O = 310 * 6.67 TPY =
CO2 = 1 * 265,110 TPY =

	GHGs (mass)	CO$_{2e}$
Existing Facility	_____ TPY	_____ TPY
Modification	_____ TPY	_____ TPY
Modified Facility	_____ TPY	_____ TPY

APPLICABILITY ANALYSIS:

Question 1: Does this facility modification require a Title V permit anyway? (e.g. significant modification, major source, regulated pollutants ≥ 100 tpy..)? (ARM 17.8.1204 and 17.8.1201(23))

Question 2: Does the permit action have GHG emissions in excess of thresholds?
> a. _____ *Facility emissions ≥ 0 TPY GHG mass*
> b. _____ *Facility emissions ≥ 100/250 TPY GHG mass*
> c. _____ *Facility emissions ≥ 75,000 TPY CO2e*
> d. _____ *Facility emissions ≥ 100,000 TPY CO2e*

WHAT ARE THE MODIFIED FACILITY'S PERMIT REQUIREMENTS?

If the Permit Decision occurs before 1/2/2011: *GHG's do not need to be considered*

Step 1: If the permit decision occurs between 1/2/2011 and 7/1/2011:

PSD
Does the modification, unto itself, trigger a PSD action "anyway" for non-GHG pollutants?
> *- If NO then GHG's do not undergo PSD review*
> *- If YES further analysis would be required to determine if GHGs are subject to PSD:*
>
> *1. Does the modification result in GHG mass emissions ≥ 0 TPY ?* _____ *Yes/No*
> *2. Does the modification result in CO2e emissions increase ≥ 75,000 TPY?* _____ *Yes/No*
> > *Yes to (1) and (2)   - then the GHGs must undergo PSD review.*
> > *NO to (1) or (2)   - then the GHGs do not undergo PSD review.*

Title V
Is the change to the facility considered significant and require a modification of the Title V Operating Permit - "Anyway"?
> *No - GHG's do not need to be addressed.*
> *Yes - GHG's must be addressed in the Title V Operating permit.*

Step 2: If the permit decision occurs after 7/1/2011:

PSD
Is the modification to the facility subject to PSD?
> 1. ***Is the existing facility a major stationary source? (criteria pollutants exceed 100 tpy for a listed source or 250 tpy)***
>
>   *- If Yes*, *facility is a stationary source, then do the modification's criteria pollutants exceed the Significant Emissions Rate(SER)? (ARM 17.8.801(27))*

- Yes, then the facility must undergo PSD review for applicable regulated pollutants including GHGs:

    1. Does the modification increase GHG mass emissions ≥ 0 TPY ? ___ Yes/No

    2. Does the modification increase CO2e emissions ≥ 75,000 TPY? ___ Yes/No

        Yes to (1) <u>and</u> (2) - then the GHGs must undergo PSD review.

        NO to (1) <u>or</u> (2) - then the GHGs do not undergo PSD review.

- No, the modifications criteria pollutants do not exceed SERs, then proceed to #2.

***-If No**, facility is not an existing stationary source, then do the modification's criteria pollutants exceed 100 tpy for a listed source or 250 tpy (a major source unto itself)?*

    - If Yes, then the facility must undergo PSD review for applicable regulated pollutants:

        1. Does the modification increase GHG mass emissions ≥ 0 TPY ? ___ Yes/No

        2. Does the modification increase CO2e emissions ≥ 75,000 TPY? ___ Yes/No

            Yes to (1) <u>and</u> (2) - then the GHGs must undergo PSD review.

            NO to (1) <u>or</u> (2) - then the GHGs do not undergo PSD review.

    - If No, the modifications criteria pollutants do not exceed 100/250 TPY, then proceed to #2.

2. Do the GHG emissions exceed thresholds?

    a. Existing facility CO2e emissions ≥ 100,000 TPY   ____ Yes/No

    b. Existing facility GHG mass emissions ≥ 250/100 tpy ____ Yes/No

    c. Modification's GHG mass emissions ≥ 0 tpy   ____ Yes/No

    d. Modification's CO2e emissions ≥ 75,000 TPY CO2e   ____ Yes/No

- Yes to (2)(a)-(d) - then the facility must undergo PSD review for GHGs and other applicable regulated pollutants

- NO to any one 2(a)-(d) - then proceed to (e)-(g).

    e. Existing <u>facility</u> CO2e emissions ≥ 100,000 TPY   ____ Yes/No

    f. Modification's GHG mass emissions > 250/100 tpy   ____ Yes/No

    g. Modifications CO2e emissions ≥ 100,000 TPY CO2e ____ Yes/No

- Yes to (2)(e) – (g) - then the facility must undergo PSD review for GHGs and other applicable regulated pollutants

- NO to any one (2)(e)-(g) - then the GHG do not undergo PSD review.

<u>Title V</u>

Does the change to the existing facility require a modification of the Title V Operating Permit?

    No - applicable requirement for GHG's do not need to be addressed.

    Yes – applicable requirements for GHG's must be addressed in the Title V Operating permit.